



AAR-100

Human Factors Newsletter # 03-12

July 5, 2003 – July 18, 2003

Recent Publications/Project Reports:

Occupational Vision Standards: A Review. Bettina L. Beard, Willa A. Hisle, Albert J. Ahumada, Jr.

Effective aircraft maintenance inspection requires non-destructive inspection and testing (NDI/NDT) personnel to be experienced, skilled and able. The present certification and qualification process requires applicants to pass written and practical examinations in order to demonstrate that they are qualified to carry out specific NDT methods. Currently, no common standard exists in the aviation industry for the visual qualifications of inspectors; however, various airlines and aircraft maintenance facilities have developed their own respective vision qualification programs. This highlights the need for a uniform and universally accepted set of vision standards that would apply to all aircraft NDI/NDT personnel.

This report was commissioned by the FAA to partially fulfill FAA Aviation Maintenance Requirement 193, which calls for *Vision Testing Requirements for Certain Persons Maintaining and Inspecting Aircraft and Aircraft Components*. In collaboration with the FAA, NASA has proposed a research plan designed to specify visual needs in relation to specific occupational tasks of aviation maintenance workers and inspectors. As a first step, this literature review was performed to identify and summarize published research relevant to setting occupational vision standards for NDI/NDT personnel.

The review is a compilation of a text and Web-based search for occupational vision requirements, knowledge gained from site visits to major aircraft maintenance facilities, relevant information from aviation technical, mechanical, and inspection textbooks, the FAA maintenance human factors Web site, and the human vision literature. A principal intent of this literature review is to gather current knowledge about aircraft inspection and human vision, combined with current vision standards required for various other occupations, in preparation for establishing vision standards for specific NDI and visual inspection tasks.

One question that arises is whether standards used in other “Materials Evaluation” occupations can be borrow for aircraft inspection. Certification programs that include vision requirements

have been written by organizations such as the military, welders, and mechanical engineers. Here we discuss such standards and their applicability to the vision demands in aircraft inspection.

Optimally, this literature review would follow a thorough vision task analysis for NDI and visual inspection. Although task analysis and descriptions have been performed on aircraft maintenance inspection (Gramopadhye & Kelkar, 1999), these analyses have not focused on the role of visual processes; thus, a more detailed analysis is needed to verify visual task demands. The list of visual functions described in the report is not based on a rigorously obtained taxonomy, but instead is based on observations made at aviation maintenance facilities by the authors during site visits.

The report is divided into four main sections. The first section describes the FAA requirements calling for vision standards for NDI/NDT inspectors. It is followed by a discussion of NDI/NDT basic training, tasks and associated visual needs and provides an overview of field observations taken by the authors. Section 2.0 excerpts the visual perception literature as it pertains to setting visual requirements. It will be shown that the tools to predict real-world performance are just now reaching maturity. This section also outlines current vision standards for several vision-intensive occupations, and whether these standards were empirically derived, based on expert opinion, or borrowed from other occupations. The authors discuss to what extent these standards can be applied to aviation maintenance inspection. In section 3.0, recommendations are provided to vision standards that specifically relate to the vision needs of NDI/NDT inspectors. In the conclusion, it is recommended that current vision standards written for other occupations cannot be directly adopted when writing aircraft inspection vision standards since the tasks performed by different occupations differ substantially from aviation maintenance inspection tasks. Additionally, most occupational vision standards are not empirically substantiated and appear to be arbitrarily decided. For more information, see:

<http://www.hf.faa.gov/docs/508/docs/maint/FY02/VisionNASAIinterimRpt.pdf>

NATPRO: Dr. Julia Pounds, Ms. Deborah Thompson, and Mr. Dan Jack traveled to Miami to assist in completing the NATPRO (National Air Traffic Professionalism) feasibility project. The project, conducted by the NATPRO team in concert with personnel at Miami ARTCC, assessed the viability of using a cognitive "workout program" of computer based exercises for ATC. (J. Pounds, CAMI)

Cockpit Displays: Dr. Dennis Beringer participated in the MEOT for Universal's Vision 1 system at the Los Angeles ACO on June 25th and 26th. Airborne evaluations were conducted over several days and participants were present from the Small Airplane Directorate, the Transport Airplane Directorate, the Wichita ACO, the Long Beach AEG, and the LA ACO. Evaluations were summarized on the final day of the meeting and recommendations were presented to the applicant. (D. Beringer, CAMI)

Electronic Flight Bag (EFB): On July 16-17, Volpe researcher Divya Chandra attended a meeting of the Airline Transport Association Digital Data Working Group in Charlotte, NC. She updated the group of airline representatives and EFB manufacturers on her research toward developing tools and methods for evaluating the usability of EFBs. The products of the work are

being developed specifically to support the FAA Aircraft Certification Service in conducting field evaluations of EFBs, but they will also be distributed publicly for EFB vendors and customers to use if desired. (D. Chandra, VNTSC, T. McCloy, AAR-100)

ETMS: Tanya Yuditsky traveled to the Air Traffic Control System Command Center (ATCSCC) to attend a Requirements Review for the Enhanced Traffic Management System (ETMS) Version 7.8. The ETMS is used by Traffic Flow Management Specialists at the ATCSCC, the en route centers, and large TRACONs to monitor the flow of air traffic through the NAS. Version 7.8 will introduce functions such as representation and traffic counts for combined sectors, and enhanced tools for creating reroute advisories. (E. Stein, WJHTC)

IIDS: Engineering Research Psychologists from ACB-220 traveled to Washington to brief representatives from AUA-420, ARU, ARQ, and others on the development of human-computer interface requirements for Flight Services' Integrated Information Display System (IIDS). This system will provide Flight Service Specialists with a single point of access to information that is currently available in books, paper charts, and several automated systems. The requirements are based on a three-phased activity: (1) field research on user needs and the use of existing information display systems; (2) development of a prototype based on Phase 1 results; and (3) validation and refinement of the prototype with Flight Service Specialists from the field. (T. Yuditsky, ACB-220)

NTML: Engineering Research Psychologists from ACB-220 supported a National Traffic Management Log (NTML) user team meeting. The team conducted testing of the upcoming release of the program. During testing, they validated implementation of design concepts that had been developed during earlier activities and identified issues that related to both functionality and human-computer interface usability. The researchers worked with the team to develop recommendations for issue resolution that were consistent with human factors design guidelines and best practices. They also led a review of the requirements for future releases. During this review, they highlighted areas that may pose usability risks and provided recommendations for improvement. For some issues, the researchers developed prototypes of various display options for the team to review and evaluate. (T. Yuditsky, ACB-220)

ARA MWE Logo Contest: Congratulations to AAR-100's Larry Cole who submitted the winning logo for the ARA MWE logo contest. Larry's winning entry was selected best out of the 15 entries. (T. Kraus, AAR-200)

*More information on human factors research can be found at
the FAA Human Factors (AAR-100) web site: <http://www.hf.faa.gov>*

Mark D. Rodgers
FAA (AAR-100)



July 20-24, 2003 - 2003 International Symposium on Performance Evaluation of Computer and Telecommunication Systems (SPECTS '03)

<http://www.scs.org/confernc/coninfo.html#spect2003>

July 21 – 23, 2003 - 4th Australian Pacific Vertiflite Conference on Helicopter Technology, Melbourne, Victoria, Australia. Contacts: [Dr. Arvind K. Sinha](#) and [Mr. Raden Kusumo](#)

July 29-August 4, 2003 – 51st Annual AirVenture, Oshkosh, WI <http://airventure.org/>

August 4-8, 2003 – SAE G-10 Behavioral Engineering Technology Committee Meeting, Seattle, WA http://forums.sae.org/access/dispatch.cgi/TEAG10_pf/folderFrame/100142/0/def/5f53

August 7, 2003 – Human Factors Acquisition Working Group Meeting, FOB 10A, Washington, DC <mailto:glen.hewitt@faa.gov>

August 7-10, 2003 – 111th Convention of the American Psychological Association, Toronto, Ontario, Canada <http://www.apa.org/convention>

August 12-12, 2003 – REDAC Human Factors Subcommittee Meeting, Washington, DC
<mailto:gloria.dunderman@faa.gov>

August 19-21, 2003 – Fifth NASA/FAA Workshop on Risk Analysis and Safety Performance Measurements in Aviation, Baltimore, MD <http://aar400.tc.faa.gov/aar424/Workshop2003/>

September 3-10, 2003 – EUROCONTROL 11th Air Navigation Conference and Exhibition, Montreal, Canada <http://www.eurocontrol.be/newsroom/events/index.html>

September 8-12, 2003 – EUROCONTROL 9th Global TRAINAIR Conference and Training Symposium, <http://www.eurocontrol.be/newsroom/events/index.html>

September 8-12, 2003 – SAE Aerospace Congress and Exhibition, Palais des Congrès, Montreal, Quebec, Canada <http://www.sae.org/calendar/aeromtgs.htm>

September 15-17, 2003 – FAA/TCA/CAA Safety Management in Aviation Maintenance Symposium, Toronto, Canada

September 16 – 18, 2003 - 29th European Rotorcraft Forum, Friedrichshafen, Germany. Contact B. Gmelin at bernd.gmelin@dir.de

September 16-18, 2003 – MRO Europe, Cardiff International Arena, Cardiff, Wales
<http://www.awgnet.com/conferences/meumain.htm>

September 16-19, 2003 – Investigation and Reporting of Incidents and Accidents (IRIA), Williamsburg, VA <http://shemesh.larc.nasa.gov/iria03/>

September 17-18, 2003 – FAA Research, Engineering and Development Advisory Committee (REDAC) Meeting, Washington, DC <mailto:gloria.dunderman@faa.gov>

September 17-19, 2003 – 3rd Air Cargo Economics Conference, Sheraton Amsterdam Airport Hotel & Conference Center, Netherlands
<http://www.euroavia.com/conf/default.html>

September 17-21, 2003 - Institute of Electrical and Electronics Engineers (IEEE) 25th Annual Engineering in Medical and Biology Society International Conference, Cancun, Mexico
<http://itzamna.uam.mx/cancun/>

September 18-19, 2003 – National Academy of Engineering 2003 Frontiers of Engineering Symposium, Irvine, CA [Welcome to the National Academy of Engineering \(NAE\)](http://www.nae.org)

September 22-24, 2003 - 41st Annual SAFE Symposium, Jacksonville, FL
<http://www.safeassociation.org/2003symposium1.htm>

September 22 – October 3, 2003 – ICAO 11th Air Navigation Conference, Montreal, Canada
<http://www.icao.int/icao/en/anb/meetings/anconf11/index.html>

September 24-25, 2003 –IATA/ICAO/Flight Safety Foundation ICARUS Committee/University of Texas LOSA Meeting, Montreal, Canada <mailto:helmreich@mail.utexas.edu>

September 24-26, 2003 - Institute of Electrical and Electronics Engineers (IEEE) International Symposium on Technology and Society, Amsterdam, The Netherlands
<http://radburn.rutgers.edu/andrews/projects/ssit/istas03.pdf>

October 5-8, 2003 - Institute of Electrical and Electronics Engineers (IEEE) International Conference on Intelligent Control, Houston, TX <http://vlab.ee.nus.edu.sg/~isic2003/>

October 5-8, 2003 - 2003 IEEE International Conference on Systems, Man, and Cybernetics, Washington, DC http://becat.engr.uconn.edu/IEEE_CSMC_2003/

October 6 – 9, 2003 - NATO Research and Technology Agency, Applied Vehicle Technology Panel (AVT) will present "The Vehicle Propulsion Integration Symposium" in Poland. For more information contact cheynes@rta.nato.int

October 7 – 9, 2003 - National Business Aviation Association Annual Meeting & Convention, Orlando, Florida. Contact: www.nbaa.org

October 13-17, 2003 – Human Factors and Ergonomics Society 47th Annual Meeting, Adams Mark Denver Hotel, Denver, CO <http://www.hfes.org/>

October 15, 2003 – Royal Aeronautical Society Conference on Mitigating Human Error, London UK <http://www.aerosociety.com/homepage.asp>

October 17-19, 2003 – EUROCONTROL IFATCA European Regional Meeting, Porto
<http://www.eurocontrol.be/newsroom/events/index.html>

October 26-30, 2003 – ATCA 48th Annual International Technical Program and Exhibits, Marriott Wardman Park Hotel, Wash, DC http://www.atca.org/static2_item.asp?item_ID=19

October 27-28, 2003 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

October 27-30, 2003 – SAE DoD Maintenance Symposium and Exposition, Valley Forge Convention Center, King of Prussia, PA <http://www.sae.org/calendar/aeromtg.htm>

November, 2003(tentative) – DOD TAG-50, Fall 2003, Phoenix, AZ
<http://hfetag.dtic.mil/meetschl.html>

November 5-6, 2003 – Royal Aeronautical Society Flight Simulation Group Conference on “Simulation of the Environment”, London, UK <http://www.raes.org.uk/homepage.asp>

November 5-7, 2003 – FAA Centers of Excellence 3rd Joint Annual Meeting, Daytona Beach Hilton Oceanside Resort, Daytona Beach, FL
http://www.embryriddle.edu/research/FAA_COE_Meeting/index.html

November 17-20, 2003 – 56th Annual Air Safety Seminar, A Joint Meeting of Flight Safety Foundation, International Federation of Airworthiness, and International Air Transport Association, Bangkok, Thailand <http://www.flightsafety.org/seminars.html>

December 2-4, 2003: National Training Systems Association Inter-Service/Industry Training, Simulation and Education Conference (I/ITSEC), Orlando, FL <http://www.trainingsystems.org>

December 9-12, 2003 - Institute of Electrical and Electronics Engineers (IEEE) Decision and Control Conference, Maui, HI <http://www2.acae.cuhk.edu.hk/~ycliu/cdc03/>

January 11-15, 2004 – Transportation Research Board Annual Meeting, Washington, DC
<http://www4.trb.org/trb/annual.nsf>

January 21 – 23, 2004 - AHS 4th Decennial Specialists' Meeting on Aeromechanics, Fisherman's Wharf, San Francisco, CA. For more information contact the Technical Chairman, Tom Maier at tmaier@mail.acr.nasa.gov

March 22-25, 2004 – HPSAA II Conference, Human Performance, Situation Awareness, and Automation Technology, hosted by Embry-Riddle Aeronautical University and the University of Central Florida, Hilton Oceanfront Resort, Daytona Beach, FL
<http://faculty.erau.edu/vincenzd/hpsaa>

April, 2004 – SAE General Aviation Technology Conference and Exhibition, Century II Convention Center, Wichita, KS <http://www/sae.org/calendar/aeromtgs.htm>

April 18-21, 2004 – FAA Worldwide Airport Technology Transfer Conference, Hilton Atlantic City Hotel, Atlantic City, NJ <http://www.airtech.tc.faa.gov/att04/>

May 3-6, 2004 – 75th Annual Scientific Meeting of the Aerospace Medical Association, Egan Convention Center, Anchorage, AK <http://www.asma.org/>

May 6-8, 2004 - AHS International 60th Annual Forum and Technology Display, Virginia Beach, VA. Contact Staff@vtol.org

May 10-12, 2004 – Royal Aeronautical Society 10th AIAA CEAS Aeroacoustics Conference, Manchester Town Hall, UK <http://www.aerosociety.com/homepage.asp>

May 26-27, 2004 – Royal Aeronautical Society Conference – Flight Simulation 1929-2029, A Centennial Perspective, London, UK <http://www.aerosociety.com/homepage.asp>

July 27-August 2, 2004 – 52nd Annual AirVenture, Oshkosh, WI <http://airventure.org/>

July 28 – August 1, 2004 – 112th Convention of the American Psychological Association. Honolulu, Hawaii <http://www.apa.org/convention>

September 20-24, 2004 – Human Factors and Ergonomics Society 48th Annual Meeting, Sheraton New Orleans Hotel, New Orleans, LA <http://www.hfes.org/>

October 18-19, 2004 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

May 9-12, 2005 - 76th Annual Scientific Meeting of the Aerospace Medical Association, Kansas City, MO <http://www.asma.org/>

October 24-25, 2005 – National Academies Institute of Medicine Annual Meeting, National Academy of Sciences, Washington, DC <http://wwwsearch.nationalacademies.org/>

Note: Calendar events in Italics are new since the last Newsletter



Comments or questions regarding this newsletter?

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